



Chapter 1: Introduction to the Natural Resource Inventory of Dutchess County, NY

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DEFINITION AND PURPOSE

Dutchess County, New York has a rich natural heritage that has enabled its communities to prosper and grow, and has contributed to a high quality of life for its residents. Diverse habitats, productive farmland, abundant water resources, and scenic landscapes are all distinctive characteristics of the region that have attracted new residents and have helped foster a strong sense of place.

Natural resources consist of living things and naturally occurring materials in the environment that sustain human life and economies. Natural resources include but are not limited to air, minerals, soils, sources of energy, water, fish, wildlife, and forests.

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¹ This chapter was compiled from 2009 to 2010 by staff and interns of the Cornell Cooperative Extension Dutchess County (CCEDC) Environment Program. It is an updated and expanded version of the introductory chapter of the 1985 document, *Natural Resources, Dutchess County, New York* (NRI).

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A natural resource inventory (NRI) is a document that catalogues the physical and biological characteristics of an area, collects the data in a usable format, and interprets the findings. An NRI can serve as a planning and project review tool for municipalities at the local level, as well as a tool for county or regional planning and project assessment (Ashton, Blair, & Kendall, 1997). A better understanding of natural resources enables communities to conserve its natural resources for current and future generations.

New York State Environmental Conservation Law (ECL) Article 47 on County and Regional Environmental Management Councils mandates the Dutchess County Environmental Management Council (DCEMC) to maintain an accurate inventory of natural resources of the county.² The DCEMC, in coordination with the Dutchess County Department of Planning and Development, first published a natural resource inventory in 1985 and made it available to municipal boards and conservation advisory councils (CACs) to inform local decision-making. The DCEMC also used the NRI as an educational tool, providing copies to schools and residents and developing NRI curriculum and presentations.

This document is an updated and expanded version of the 1985 natural resource inventory. It contains new information about Dutchess County's natural resources, including geographic information and references to research findings.

COUNTY PROFILE

This inventory describes the natural resources of Dutchess County, New York. Dutchess County is centrally located within the Hudson Valley region and is bordered by Connecticut to the east, Putnam County to the south, Columbia County to the north, and Orange and Ulster Counties across the Hudson River to the west. It covers approximately 801.6 square miles, including 20 square miles of the Hudson River.

² According to NYS ECL § 47-0107, "The council shall develop and maintain an inventory of natural resources within the county and such other environmental information as may be appropriate. Said inventory shall include wetlands and open spaces and may include, but not be limited to, factors relating to geology, soils, slope, water resources, vegetation, wildlife habitat, unique natural areas, and scenic, historic, and archaeological sites."



Figure 1.1: Dutchess County, New York and environs

The county seat is the City of Poughkeepsie, located on the shore of the Hudson River. Poughkeepsie is approximately equidistant from Albany and New York City. Most of the county lies within the watershed of the Hudson River Estuary, which extends 153 miles from Troy to New York Harbor (Figure 1.1). The eastern portion of the county lies in the Tenmile River watershed, which is part of the Housatonic River watershed in Connecticut (for more information, see NRI Chapter 5: Water Resources.)

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The 2009 population estimate for Dutchess County, New York is 293,562 (U.S. Census Bureau, 2010). The population of the county has undergone a tremendous increase over the 20th century, especially over the last fifty years. Between 1790 and 1900 the population fell short of doubling in size, while between 1900 and 2008 the population increased over 3.5 times (Figure 1.2).

Most of the county's residents live along the Hudson River; the Route 9, Route 44 and Route 55 corridors; or in pockets of more dense settlements such as village hamlets (Figure 1.3).

Approximately 75 percent of the population of the county lives in the southwest region of Dutchess County, including the cities of Beacon and Poughkeepsie, the villages of Fishkill and Wappingers Falls, and the towns of Beekman, East Fishkill, Fishkill, Hyde Park, LaGrange, Poughkeepsie, and Wappinger (Table 1.1). Several municipalities in Dutchess County have seen increasing urban and suburban development over time due to population growth and conventional development strategies.

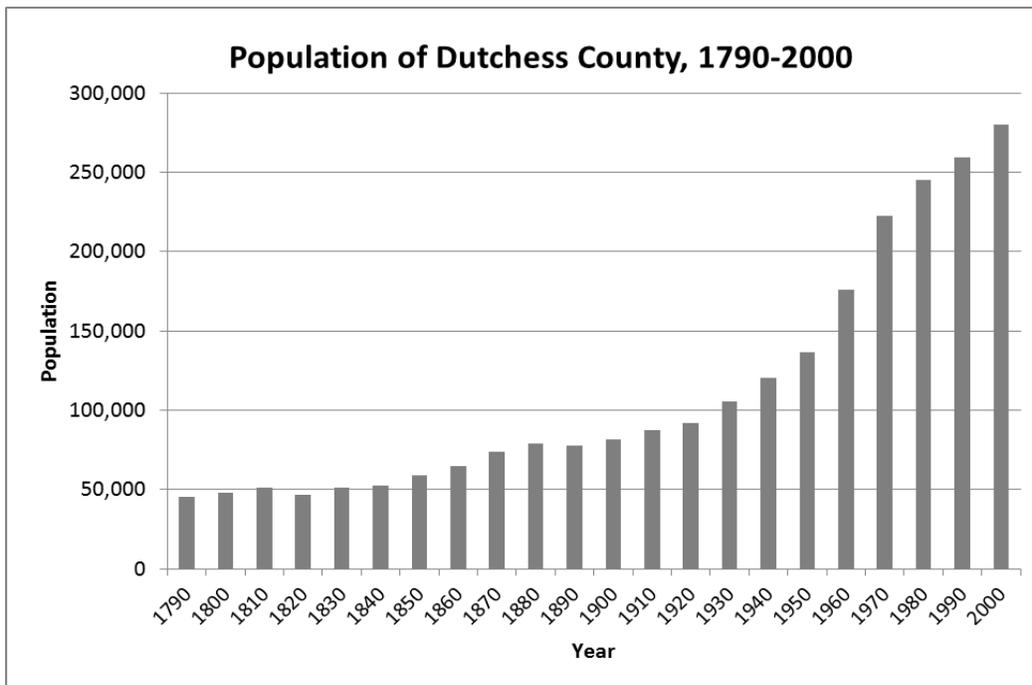


Figure 1.2: Population Growth in Dutchess County from 1790-2008 (from U.S. Census Bureau).

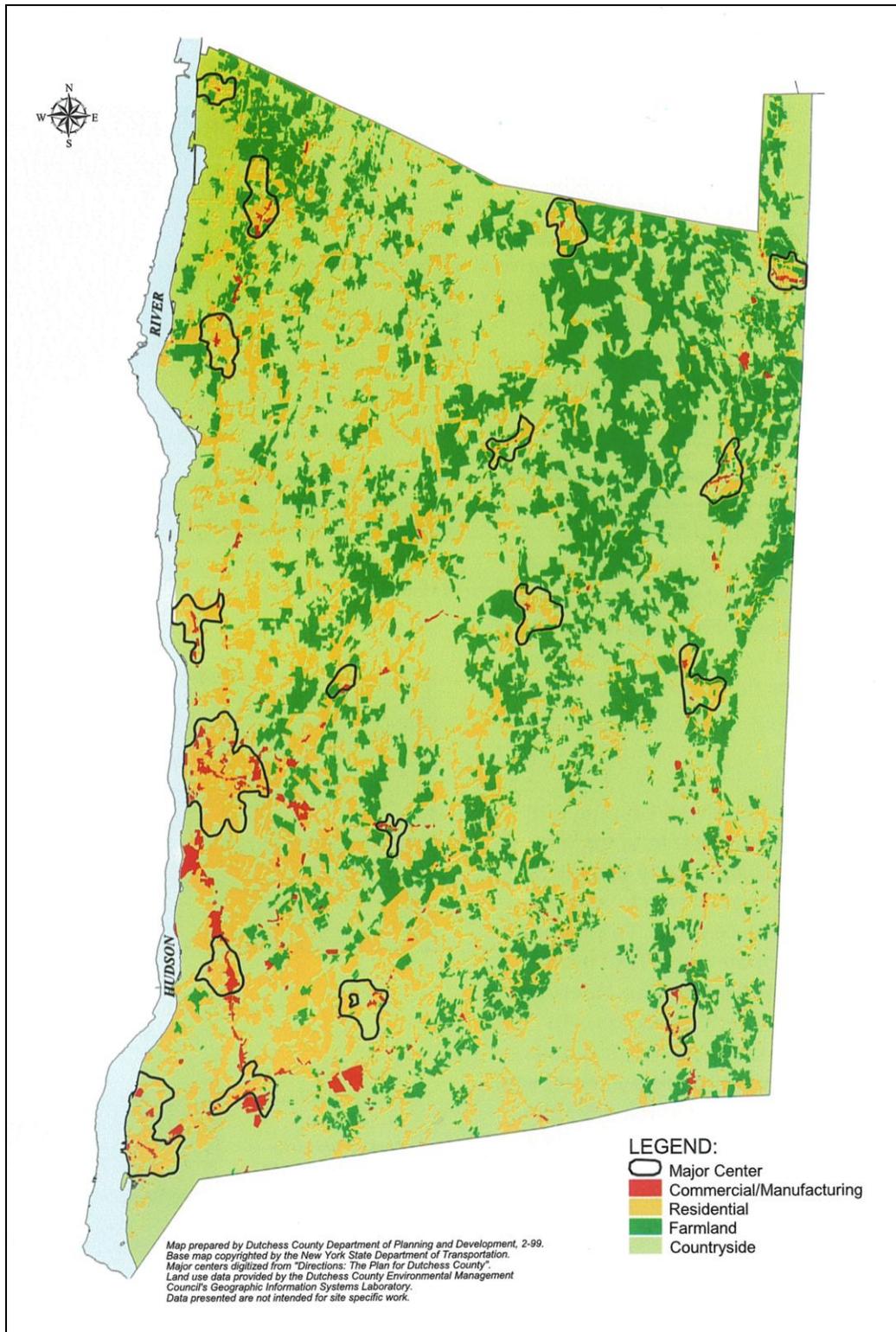


Figure 1.3: Settlement Patterns in Dutchess County (DCDPD, 2000).

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Table 1.1: Change in Population of Dutchess County municipalities (Dutchess County Department of Planning and Development, 2010)

	1990	2000	Number	Percent
Dutchess County	259,462	280,150	20,688	7.97%
City of Beacon	13,243	13,808	565	4.27%
City of Poughkeepsie	28,844	29,871	1,027	3.56%
Town of Amenia	5,195	4,048	-1,147	-22.08%
Town of Beekman	10,447	13,655	3,208	30.71%
Town of Clinton	3,760	4,010	250	6.65%
Town of Dover	7,778	8,565	787	10.12%
Town of East Fishkill	22,101	25,589	3,488	15.78%
Town of Fishkill	15,698	18,523	2,825	18.00%
Town of Hyde Park	21,230	20,851	-379	-1.79%
Town of La Grange	13,274	14,928	1,654	12.46%
Town of Milan	1,895	2,356	461	24.33%
Town of North East	2,034	2,077	43	2.11%
Town of Pawling	3,973	5,288	1,315	33.10%
Town of Pine Plains	2,287	2,569	282	12.33%
Town of Pleasant Valley	8,063	9,066	1,003	12.44%
Town of Poughkeepsie	40,143	42,777	2,634	6.56%
Town of Red Hook	6,736	7,440	704	10.45%
Town of Rhinebeck	4,833	4,685	-148	-3.06%
Town of Stanford	3,495	3,544	49	1.40%
Town of Union Vale	3,577	4,546	969	27.09%
Town of Wappinger	22,292	22,322	30	0.13%
Town of Washington	3,140	3,313	173	5.51%
Village of Fishkill	1,957	1,735	-222	-11.34%
Village of Millbrook	1,339	1,429	90	6.72%
Village of Millerton	884	925	41	4.64%
Village of Pawling	1,974	2,233	259	13.12%
Village of Red Hook	1,794	1,805	11	0.61%
Village of Rhinebeck	2,737	3,077	340	12.42%
Village of Tivoli	1,035	1,163	128	12.37%
Village of Wappingers Falls				
Poughkeepsie	889	977	88	9.90%
Wappinger	3,716	3,952	236	6.35%

Source: U.S. Census Bureau

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Dutchess County has also seen substantial changes in land use. Aerial photographs of Dutchess County from the 1930s show that majority of land was used for farming, with small hamlets and town centers (DCDPD, 2000) (Figure 1.3). Since the 1950s there has been a large shift from agriculture to suburban development, as many former farm fields have been sub-divided for use as housing and commercial developments (DCDPD, 2000). The most recent aerial photographs show in some cases dramatic land use conversion, such as along the Route 9 corridor in southern Dutchess County (Figure 1.4).

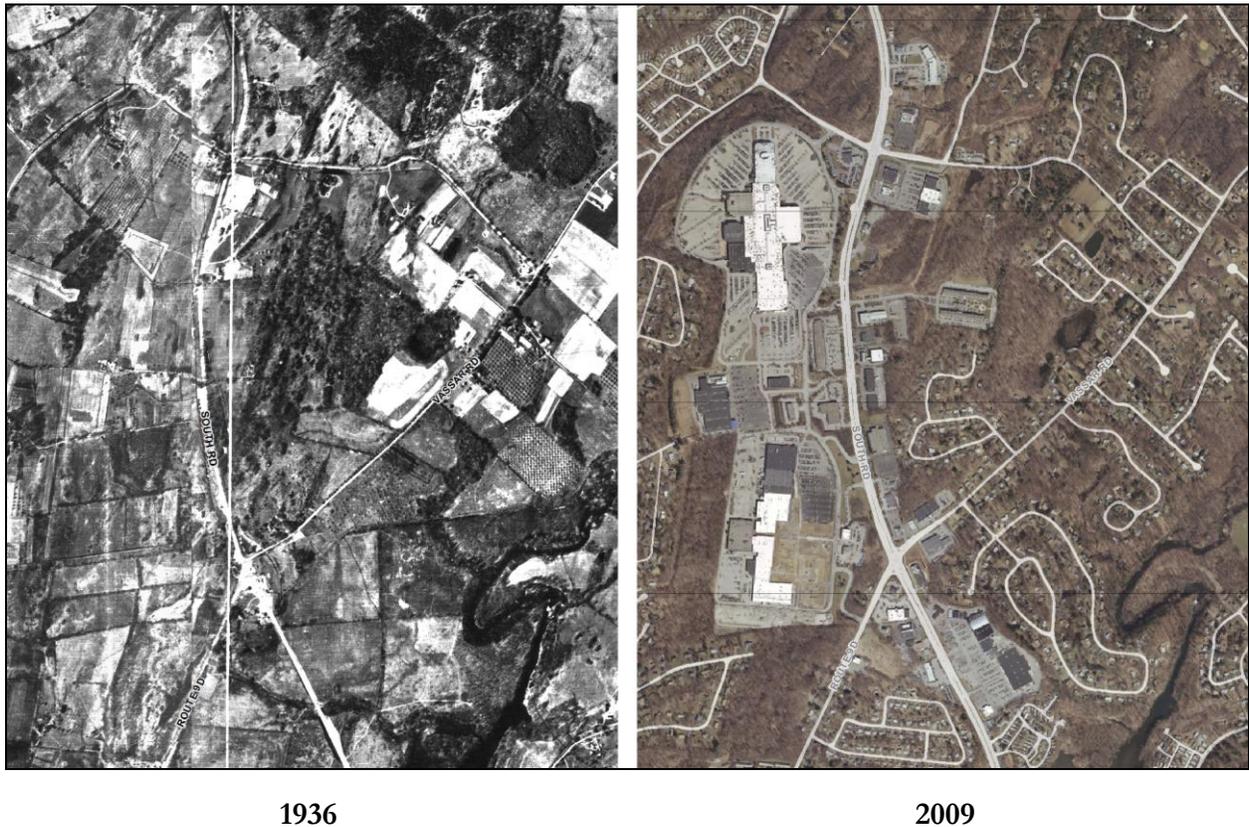


Figure 1.4: Land use changes in Dutchess County as seen in aerial photographs from 1936 to 2009.

KEY CONCEPTS

Ecosystems

An **ecosystem** is a biological community plus all of the non-living factors influencing that community (Molles, 2002). Together, the living and non-living components of ecosystems form one physical system, exchanging energy, water, and nutrients. For example, in a forest ecosystem, trees grow by incorporating water and nutrients from the soil and carbon dioxide from the air. When the trees drop their leaves in the fall, microorganisms and other decomposers break the material down. This can affect the availability of nutrients in the soil, which in turn can impact plant productivity, species composition, and many other factors. The quality and availability of soil, water, and air all play a role in how a forest ecosystem functions, as does the presence of other species including vegetation and wildlife.

Ecosystems can be as small as a community of microorganisms in a teaspoon of soil, or as large as the entire planet Earth, which is itself one whole ecosystem of interconnected living and non-living things. The size and complexity of ecosystems varies according to the scale at which we observe them. To aid in the development of conservation practices and policies at several scales, from national or continental to state and regional, scientists and policymakers group areas with similar ecosystems into **ecological regions**. At the most broad scale, Dutchess County is located within the eastern temperate forest ecological region (CEC, 1997), distinguished by its moderate to mildly humid climate, its relatively dense and diverse forest cover, and its high density of human inhabitants; this region includes most of the land from the Great Lakes to the Gulf of Mexico, from the Mississippi River to the Atlantic Ocean (CEC, 1997). At more local scales, topographic and rainfall patterns within different parts of Dutchess County support different types of vegetation and wildlife communities. For example, north-facing slopes and steeply sloping ravines support northern temperate forest tree species (such as hemlock, maple, beech, birch) while in lowland areas of the County one might find forests dominated more by oak and other Appalachian oak-hickory forests.

Interactions within ecosystems are affected by the geologic setting in which they occur. Geologic processes determine topography, soil structure, and the distribution and availability of water; these underlying conditions vary across the landscape, supporting different types of ecological

communities. For example, some geological formations in Dutchess County create conditions that provide habitat for rare and unique species. These communities are discussed in more detail in NRI Chapter 6: Biological Resources and Biodiversity.

Ecosystem Services

Ecosystem processes provide clean water, clean air, sources of food, recreational resources, and other benefits to humans. The functions performed by ecosystems that directly or indirectly benefit humans are called **ecosystem services** (Campbell & Reece, 2007). These benefits include **provisioning services** such as food, water, timber, fiber, and other natural resources; **regulating services** that affect climate, floods, disease, wastes, and water quality; **cultural services** that provide recreational, aesthetic, and spiritual benefits; and **supporting services** such as soil formation (Millennium Ecosystem Assessment, 2005) (Figure 1.5).

These services have many linkages to human well-being. They provide the basic materials for life, including food, shelter, and livelihoods (Millennium Ecosystem Assessment, 2005). Healthy ecosystems offer security and stability, in part through access to resources, which in turn contributes to healthy social relations (Millennium Ecosystem Assessment, 2005). In addition, they benefit physical health by providing clean air, clean water, and other resources (Millennium Ecosystem Assessment, 2005).

It is important to understand how ecosystems function, especially to avoid sacrificing the ecosystem services on which we depend. Because components of ecosystems are interconnected, and these relationships may be complex, changes made to one part can have an impact on others. Conserving healthy, functioning ecosystems is essential to ensure that they continue to provide us with these invaluable services over time.

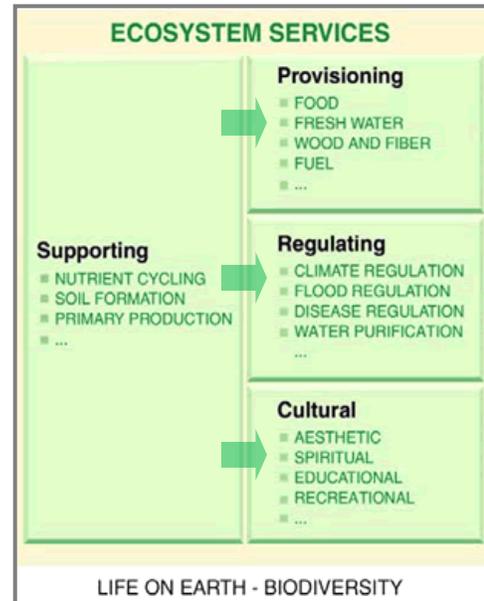


Figure 1.5: Types of ecosystem services; each has close ties to aspects of human well-being (from Millennium Ecosystem Assessment, 2005).

Sustainable Development

Sustainable development is development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (UN WCSD Brundtland Report, 1987). The actions that we take now may impact ecosystem services and natural resources in the future in either positive or negative ways. We must be proactive in planning for sustainability and recognize that the resources we currently have should not be taken for granted.

The extent and character of natural resources can impose limitations on land use and development. For example, while they may provide scenic views, steep slopes are often unsuitable for housing developments. Rich, low-lying land may be ideal for agricultural use, but may also be located within a floodplain, making it a poor choice for a building site. Groundwater is a key resource that can become contaminated or depleted if surrounding development is not properly managed. Many of the natural resources upon which we depend, including soil and groundwater, are not easily or quickly replaced once they have been depleted or degraded.

In addition to physical or engineering constraints, the goal of conserving ecosystem services can also present certain constraints. These are often “hidden” costs that appear in the long term, but it is crucial that we take them into consideration. For example, wetlands provide a number of ecosystem services, including groundwater recharge, filtering pollutants, and wildlife habitat. Activities such as filling and draining wetlands or impacts from surrounding land use practices can degrade those ecosystem services. However, by avoiding or mitigating impacts to wetlands through sustainable development practices, we can help maintain the ecosystem services wetlands provide.

The consequences of ignoring limiting characteristics and improperly using land resources through unsustainable practices are readily apparent. Fortunately, there are more sustainable alternatives, and informed decision-making can help us make the most of our natural resources now and for the future.

Sprawl and Smart Growth

Increasing **sprawl** – spread-out, automobile dependent development – has become a concern nationally and within Dutchess County (DCDPD, 2000; Stone, 2005). As our population has grown, many people have moved away from rural areas and city centers towards developments in

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outlying open areas. Sprawl is characterized by low-density residential and commercial areas extending far out of traditional settlement areas, and is often the result of poor or no land-use planning. Sprawl can cause many problems, including loss of a sense of place, habitat loss, threats to farmland, increased costs of services to local governments, and health impacts (DCPDD, 2000; [Frumkin, 2002](#); [EPA, 2001](#)).

Sprawl patterns in Dutchess County are associated with the major transportation routes, such as Route 9, Route 44, Route 55, Route 52 and Interstate 84. Extensive commercial and residential development can be found along, and spread out from, each of these transportation corridors. Planners have become increasingly aware of the problems associated with sprawl, adopting or encouraging sustainable development practices such as **smart growth** (EPA, 2004; Stone, 2005). Smart growth includes focusing development in traditional settlement areas, taking advantage of existing infrastructure, maintaining open space, implementing zoning laws which allow for multiple uses within buildings and neighborhoods, and providing access to mass transit (EPA, 2004; Dutchess County Planning and Development, 2000). Examples of how to implement smart growth principles can be found in the Dutchess County *Greenway Compact Program and Guides for Dutchess County Communities*.

Climate Change

Climate change is a critical challenge that is already affecting human beings and the natural resources upon which we rely, both globally and locally. Climate change refers to major changes in temperature, rainfall, snow, or wind patterns lasting for decades or longer (USEPA, 2010). The International Panel on Climate Change (IPCC), an international body of scientists working through the United Nations, has concluded that the earth's climate is changing much more rapidly than ever before, and this change is very likely caused by the increase in atmospheric concentrations of greenhouse gases (GHGs) emitted by humans (IPCC, 2007).

Climatic changes are already occurring, on both a global and local scale. Since 1970, average temperature in the northeastern United States has increased by 2 degrees Fahrenheit, with winter temperatures rising twice this much (Global Climate Change Impacts, 2009). Even if humans reduce our emissions of greenhouse gases into the future, the climate of Dutchess County will continue to change, with predictions of higher average annual temperatures, decreased snowfall, and

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increases in extreme precipitation, punctuated by longer periods of dry conditions (Global Climate Change Impacts, 2009). These changes will have a profound effect on our water resources, soils, air quality, and biological resources. For further detail on how climate change will affect the climate and ecosystems in Dutchess County, see NRI Chapter 2: Climate and Air Quality. As local municipal officials plan for future land use and infrastructure, it will be increasingly important to consider scientifically based projections of climatic change in the northeastern United States and Hudson Valley region.

Summary

Ecosystems are dynamic communities that provide clean water, clean air, sources of food, recreational resources, and other invaluable services to humans, as well as having their own intrinsic value. As community members and elected and appointed officials at the local level, in whose control local land use planning decisions lie, it is important to recognize the impact our growth patterns can have on ecosystem functions and to consider sustainable development or smart growth alternatives. Officials should also begin to consider the short and long-term effects of climate change as they start planning to help their communities adapt to climate change and help ecosystems become more resilient. Local decision-makers should keep all of these concepts in mind in order to help communities utilize natural resources in a sustainable fashion, while at the same time preserving their quality, value, diversity, and abundance.

HOW TO USE THIS GUIDE

The Natural Resource Inventory of Dutchess County, NY (NRI) is an important tool for locally elected and appointed officials, educators, and the general public. The NRI is intended to be used as an advisory document for officials involved with land use and natural resource planning to make more informed decisions. We encourage elected and appointed officials, including planning and zoning boards, Conservation Advisory Councils or Boards, and the Environmental Management Council, to refer to this document as they consider the value of natural resources in their communities. The public can use the NRI to help inform them of their surrounding environment and local educators can use the document to create locally relevant lesson plans about the local environment.

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Communities can use the NRI as a decision-making tool to:

- Develop a set of goals and strategies for natural resource conservation and management;
- Assess existing conditions, such as the current pattern of development and distribution of open space;
- Provide a baseline of information to assess the environmental impacts of proposed activities;
- Identify critical areas for conservation, such as wetlands, floodplains, or prime aquifer recharge areas;
- Identify threats to natural resources and plan for conservation and mitigation;
- Develop comprehensive plans that incorporate natural resource conservation; and
- Inform natural resource conservation policies, such as planning and zoning board procedures, zoning law, and ordinances.

The Natural Resource Inventory of Dutchess County, NY is formatted as an electronic document, available for download on the Dutchess County Planning and Development Department [website](#). Periodic updates will be made as budgets and time allow. The maps and data provided in the NRI are not a substitute for site-specific studies; municipal-level or parcel-level issues may need to be examined on a site-specific basis. Municipalities may have their own natural resource inventories upon which to draw. For a more detailed discussion on the implications of the natural resource inventory for local land use decision-making, see NRI Chapter 9: Implications for Decision-Making.

OUTLINE OF THE INVENTORY

This Natural Resource Inventory includes descriptions of the major resources of Dutchess County: Climate and Air, Geology and Topography, Soils, Water Resources, Biological Resources and Biodiversity, Designated Significant and Protected Areas, Geospatial Resources, and Implications for Decision-Making. Each chapter follows a similar structure, including information on the current state of the resource; its value, classification, and regulation; trends and changes seen over time; implications for decision-making; resources for additional information; and references.

RESOURCES FOR ADDITIONAL INFORMATION

- **Dutchess County Department of Planning & Development** website:
<http://www.co.dutchess.ny.us/CountyGov/Departments/Planning/16138.htm>
- **Minnesota Department of Natural Resources**, “Natural Resource Guide: A guide to Using Natural Resource Information in Local Planning”:
<http://files.dnr.state.mn.us/assistance/nrplanning/community/nrig/fullguide/overview.html>
- **1000 Friends of Minnesota**, “Conservation Design Scorecard”:
<http://www.1000fom.org/sites/default/files/ConservationDesignScorecard1000FOM.pdf>
- **New York, Smart Growth Communities**: <http://smartgrowthny.org/>
- **Pace University, Land Use Law Center**, dedicated to fostering the development of sustainable communities and regions through the promotion of innovative land use strategies and dispute resolution techniques: http://web.pace.edu/page.cfm?doc_id=23239
- **United States Environmental Protection Agency: Sustainability Program**, including information on ecosystem services, and water resources: <http://www.epa.gov/sustainability/>
- **New York State Hudson River Valley Greenway**
 - Community Planning Guide:
<http://www.hudsongreenway.state.ny.us/commcoun/commplnguide2ndedition.pdf>
 - Hudson River Valley Greenway Compact Benefits:
<http://www.hudsongreenway.state.ny.us/commcoun/commbene.htm>

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